

**SYSTEMS AND METHODS FOR A  
CONTINUOUSLY VARIABLE OPTICAL DELAY LINE**

**ABSTRACT**

**[0082]** The present invention provides systems and methods that employ a continuously variable optical delay line to introduce a delay into a transmitted optical signal. The delay line comprises a holey fiber configured in a spiral layout, wherein one end of the fiber is operative to a reflective fluid reservoir and the other end in operative to an input port. A segmented piezoelectric actuator is employed to position a reflective fluid within the fiber, utilizing a commutated technique that continuously moves the fluid. A signal received at the input port is routed through the holey fiber at an angle of incidence to achieve total internal reflection. The signal traverses towards the reflective fluid, and reflects back towards the input port after coming into contact with the fluid's surface. The delay introduced into the signal is a function of the distance traveled through the delay line.